having revised and discussed anew the observations of the Sun, made since the time of Bradley at Greenwich, at Paris, at Königsberg, to the number of 9,000, we have been forced to quite a different conclusion, viz., that the observations of the Sun are far from what they ought to be, on account of the systematic errors which affect them, and that there is no discordance between theory and observation which may not be attributed to errors in the latter.

In spite of all, the discussion of the observations of the Sun led us hence to an important result connected with the great question which agitates, at this moment, the scientific world; a result which surprised ourselves, so much had the determination of the parallax of the Sun, deduced by the director of the Berlin Observatory from the Transits of Venus in 1761 and 1769, inspired a false confidence. I arrived at the conclusion that the parallax of the Sun, estimated then at 8·57″, ought to be increased by the 25th part of its value.

Soon after, the comparison of the theory of Venus with the observations led to the same result, the necessity of increasing by $\frac{1}{25}$ the parallax of the Sun.

Finally, the theory of Mars led, in its turn, to a conclusion not less precise. It was proved that we could not account for the *ensemble* of the observations of Mars without increasing the movement of the perihelion by about one-eighth. This was the reproduction of the same fact as in the case of Mercury, and the conclusion to be drawn from it was the same, viz., that the planet Mars must be subject to the action of a quantity of matter till then neglected, and that it must be estimated at the eighth part of the mass of the Earth.

But then two hypotheses were possible, as we explained at the *séance* of June 3, 1861: either that the matter till then left out of the count resided in the belt of the small planets as a whole, or that it must be added to the Earth itself. In the latter case, and as a consequence, the parallax of the Sun must be increased by the 24th part of its received value, that is to say, that we would be led to the same result already deduced from the theories of the Sun and of Venus.

Meantime M. Fizeau has given a method for determining the speed of light, by a physical experiment, on the surface of the earth; and from this measurement, combined with the quantity of the aberration of the stars, we know that we can deduce the parallax of the Sun.

Foucault, on his part, had devised a plan of solving the same question by another method, and he was engaged in realising the experiment. I pressed him strongly to carry it into execution. We know that in the *séance* of Sept. 22, 1862, Foucault announced that he had fixed the rate of light at 298,000 kilometres per second; hence, by adopting the quantity of aberration determined by Struve, 8·86″ resulted for the parallax of the Sun, a number corresponding to an increase of 1-30th of the received value.

M. Cornu, in the important paper read by him at the last sitting, resolved definitively the question by the employment of the method of M. Fizeau. He was good enough to refer to the determination which I presented to the Academy at the sitting of July 22, 1872, based on the celebrated and very exact observation of the occultation of the star ψ^2 Aquarii by the planet Mars, an occultation observed in 1672 by the three great astronomers, Richer, Picard, and Rœmer.

Moreover, we shall combine materials obtained from various points of view on this delicate question, and will further increase by discussion the great interest which will be presented by the materials collected with so much devotion by the various expeditions destined to the observation of the present Transit of Venus. For this reason, and because the method which results from the occultation of ψ^2 Aquarii is present under a form precise and striking, we shall shortly ask permission from the Academy to deposit the work in its hands, after having given it the necessary developments.

Jupiter and Saturn have given rise to a theoretic work the extent of which has been considerable, on account of the very great mutual perturbations of the two planets. The comparison of the theory of Jupiter with the observations has presented, after the proper modifications of the elements, a complete harmony. The tables of Jupiter have also been adopted by the editor of the *Nautical Almanac* to serve for the preparation of that important work. I owe to our *confrère* Mr. Hind, superintendent of the *Nautical Almanac*, the satisfaction of thus seeing adopted by the astronomical world the various tables of Mercury, the Sun, Venus, Mars, and Jupiter, so far as they have appeared.

The tables of Saturn are now constructed, and their comparison with the observations is almost finished.

The theories of Uranus and of Neptune being also completed, it only remains further to effect their comparison with the observations.

The profound knowledge which my excellent colleague M. Gaillot, chief of the Bureau des Calculs, and member of the Council of the Observatory, has of these matters, and the devotion with which he has assured the laborious construction and comparison of the tables of Jupiter and Saturn, are to me a sure guarantee that the final work will be, whatever happens, carried out to the end.

RUSSIAN FORESTS

VEGETATION in the fossil or recent state forms the main source of the wealth and prosperity of most nations, either directly or indirectly: directly, in the case of the vast subterranean deposits of the remains of former plant-life in Britain, as also in the broad expanses of land covered with timber-trees in Russia. According to recent statistics* the extent of the forests of Russia in Europe is about 442,897,500 acres, or forty per cent. of the whole area. The forests are very unequally distributed, and internal communication is still very imperfect in many parts of the empire; hence much of this wealth is at present unavailable. Every year, however, the facilities for transport are increased, and there is a corresponding augmentation in the amount realised. Nearly sixty-five per cent. of the forest land is situate in the four governments of the North—Archangel, Vologda, Olonetz, and Perm; this equals sixty-five acres to each inhabitant. The governments of the South are relatively poor in timber, and in some parts almost treeless; but since 1842 the forest administration has been engaged in remedying this defect by planting largely. Between 1866 and 1870 upwards of 20,000 acres were planted, exclusive of the action of private owners. The principal trees are the Scotch pine, spruce fir, larch, birch, lime, aspen, and oak. To these may be added for the governments of the South, though relatively playing an unimportant part in commerce, the elm, ash, beech, hornbeam, maple, various poplars and willows, &c. The value of the forest products exported in 1871 amounted to 16,026,553 roubles, of which more than one-third came to this country. But the internal consumption gives a better idea of the immense wealth of these forests. It is only possible to give an approximate estimate of the value, which Mr. Werekha states must be at the very least 265,450,000 roubles per annum. In Russia, wood is still either the only or the principal fuel used. The railways consume wood for fuel to the annual value of 7,200,000 roubles. Wooden drinking-vessels, platters and spoons, take the place of pottery and metal in many districts, except in the houses of the rich. Mr. Werekha estimates that forty million wooden spoons are made every year; but Mr. Weschniakoff, in his account of the domestic industries of Russia, puts the figure at thirty millions.

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* "Notice sur les Forêts et leurs Produits," etc. Par P. N. Werekha.

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But the most destructive industry, so far as the forests are concerned, is the manufacture of bast mats, bark boots (*lapti*), cordage, and other articles prepared from the liber or inner bark of the lime, birch, and willow, chiefly of the former tree. It is computed that 100,000,000 pairs of *lapti* are made annually, each pair requiring the bark of four young trees; thus 400,000,000 trees are cut down every year for shoes! Lime-trees from five to ten years of age, and half-grown birch, are employed for this purpose. Such reckless waste is much to be regretted; and Mr. Werekha observes that the pines are tapped for their resin and bled to death in from ten to fifteen years, in the same way as the Landes of Gascony were denuded of their pine-forests during the last century.

The previously almost useless aspen, either for fuel or building, has attained to considerable importance within the last few years as a material for paper-making. There are already ten manufactories actively engaged in the preparation of this paper in Russia, and two in Finland; and as vast reserves of this tree have accumulated in the forests, it is expected to prove a source of great riches for many years to come. Timber, of course, is the most valuable article exported, though resinous products and bast mats bring in a large sum. The Scotch pine, spruce fir, birch (for coach-building), and the oak, are the principal and almost the only timbers exported. Speaking of the giant oaks of Russia, Mr. Werekha becomes almost sentimental, for they form the strength of British and French shipbuilders, and occasionally revisit their native country in a form by no means flattering to national pride, as the Russians are still very small shipbuilders.

THE INDIA MUSEUM[*]

THE India Museum, at present located at Whitehall, has long been known for its extensive and valuable collections of Indian products, a collection too valuable, indeed, not to have been made more available, both for scientific and commercial purposes, than it has been. The removal, however, of the specimens to the galleries at South Kensington will bring them within the reach of ordinary mortals who have neither bodily strength nor inclination to make a pilgrimage to the topmost floor of one of the highest buildings in London.

The importance and value of these collections has to some extent been shown in the several reports which have from time to time been issued from the Foreign Office. Dr. Forbes Watson, as Reporter on the Products of India, has done much service in this respect, and Dr. M. C. Cooke, who has drawn up the present report, is no novice amongst Indian gums and resins, having gained an extensive experience from his long official connection with the Museum.

There are, no doubt, many products of the Indian forests that ought to be included in European commerce, but, from the want of a proper knowledge of their uses, have never established themselves in the market. Individually, we have often deplored the prevailing prejudice amongst commercial men in favour of old and well-known commodities, amounting sometimes even to the absolute rejection of new products, without giving such products a fair trial. Dr. Forbes Watson, in an introductory note to the report under consideration, in reference to this, says it should "be remembered that gums or resins sent over for valuation in the London market are necessarily subject to comparison and competition with the very best qualities of the same substances which come into any of the European markets, and that careful collection is not a too frequent characteristic of Indian products." Dr. Watson further points out that it is of very great importance to the existing and future trade of India that samples should be sent home in sufficient quantity for report, since this is the only means by which they can be brought under the notice of competent authorities. For this purpose it is suggested that in the case of gums, resins, &c., quantities of from 20 lbs. to 25 lbs. would be sufficient for distribution amongst brokers and traders, as well as for analysis and experiments. The necessity, also, of obtaining accurate information on the botanical source of the plant yielding any particular product is strongly urged. The value of accurate specimens gathered at the time of collecting the article itself, whether it be gum, resin, wood, or fibre, must be apparent to everyone, and is strongly advocated in the article "Botany" in the "Admiralty Manual." In all cases such specimens should consist of leaves, flowers, and, where possible, fruits also, securely labelled and numbered, so that no mistake may occur.

This report of Dr. Cooke's is valuable, as it brings together nearly all that has been written on the gums and resinous products of India. The botanical synonymy of each species, with references, is first given; next, a short botanical description; then its habitat, native names, history, description, and uses; and finally, in the case of the most important products, references to the works where the subject has been treated of. Dr. Cooke has brought his report down to the most recent period, for we find under the genus Garcinia, of which the species are described as yielding gum, a description of *G. Griffithii*, with the following note:—"Anderson says of this plant that there is in Maingay's herbarium a plant very like it in habit, but described by him as having a circumsciss anther, which is cultivated in Singapore as the true gamboge of Siam. There still appears to be some doubt as to the source of Siam gamboge, which Dr. Hooker seems disposed to attribute to this tree." The fact is, that in the most recent revision of the order, *Garcinia Griffithii* of Anderson has been considered identical with *G. morella*, var. *pedicellata*, to which Siam gamboge has been referred by Hanbury, and which Dr. Hooker thinks has sufficiently distinctive characters to raise it to the rank of a species under the name of *G. Hanburyi*. Again, Dr. Cooke refers to the very recent work of Flückiger and Hanbury, in which Siam gamboge is attributed to *G. morella*, var. *pedicellata*, as stated above. Indeed, throughout the report there are frequent references to the "Pharmacographia," but we are not a little surprised that Stewart and Brandis's "Forest Flora" is not quoted. Thus, for instance, at p. 24 of the report, the Marking Nut, *Semecarpus anacardium*, is dismissed with very few lines; while in the "Forest Flora" is an excellent description of the tree; of the wood, which "is full of an acrid juice which causes swelling and irritation, so that the timber cutters object to fell it unless it has been ringed for some time;" and of the fruit and the black varnish, which is prepared from the pericarp, and which is used mixed with lime-water for marking cotton. Small consignments of these fruits occasionally arrive in this country, and not long since a quantity of a very fine kind came into the hands of a London house.

J. R. J.

UMBELLULA, OR CLUSTER POLYP

ABOUT six months since (vol. x. p. 142) we referred to a letter from Prof. Wyville Thomson, in which he mentions having brought up from a depth of nearly 1,500 feet, between Prince Edward's Island and the Crozets (Kerguelen's Land), specimens of an Umbellula. When the *Challenger* was between the coasts of Portugal and Madeira, several specimens of another species of the same rare genus, but from a depth of about 2,000 feet, were also dredged up. The history of these curious Cluster Polyps is interesting. Some hundred and twenty years ago, and some one and twenty years before M. Kerguelen discovered the land now bearing his name,

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[*] Report by Dr. M. C. Cooke, on the Gums, Resins, Oleo-resins, and resinous products in the India Museum, or produced in India. Prepared under the direction of the Reporter on the Products of India. 1874.

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